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Synopsis of *Nekemias* Raf., a segregate genus from *Ampelopsis* Michx. (Vitaceae) disjunct between eastern/southeastern Asia and eastern North America, with ten new combinations

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Abstract

The genus *Nekemias* (Vitaceae) was first recognized by Rafinesque in 1838. It has been treated as a synonym of *Ampelopsis* Michx. Recent phylogenetic studies suggest that *Ampelopsis* as traditionally delimited is paraphyletic. To maintain the monophyly of each of the genera of Vitaceae, we herein segregate the *Ampelopsis* sect. *Leeaceifoliae* lineage from *Ampelopsis* and recognize these taxa in *Nekemias* Raf., which has a disjunct distribution in eastern to southeastern Asia and eastern North America. Nomenclatural changes are made for nine species and one variety: *Nekemias arborea* (L.) J. Wen & Boggan, *N. cantoniensis* (Hook. & Arn.) J. Wen & Z.L. Nie, *N. celebica* (Suess.) J. Wen & Boggan, *N. chaffanjonii* (H. Lév. & Van.) J. Wen & Z.L. Nie, *N. gongshanensis* (C.L. Li) J. Wen & Z.L. Nie, *N. grossedentata* (Hand.-Mazz.) J. Wen & Z.L. Nie, *N. hypoglauca* (Hance) J. Wen & Z.L. Nie, *N. megalophylla* (Diels & Gilg) J. Wen & Z.L. Nie, *N. megalophylla* var. *jiangxiensis* (W.T. Wang) J. Wen & Z.L. Nie, and *N. rubifolia* (Wall.) J. Wen & Z.L. Nie. A taxonomic key is provided for the genus to facilitate identification.

Keywords

Ampelopsis, Asia, eastern North America, *Nekemias*, Vitaceae

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Introduction

Ampelopsis Michx. (Vitaceae) is one of the 15 recognized genera in Vitaceae with about 25 species (Suessenguth 1953; Chen et al. 2007; Wen 2007; Wen et al. 2013a). The genus was shown to be paraphyletic by recent phylogenetic analyses based on plastid (Soejima and Wen 2006; Ren et al. 2011; Nie et al. 2012) and nuclear *GAI1* (Wen et al. 2007) analyses. The plastid data (Soejima and Wen 2006; Ren et al. 2011; Nie et al. 2012) supported that the African *Rhoicissus* and the South American *Cissus striata* complex formed a clade with the simple or palmately leaved *Ampelopsis* (sect. *Ampelopsis*), while the nuclear data (Wen et al. 2007) suggested that they were more closely related to the pinnately leaved *Ampelopsis* (sect. *Leeaceifoliae*, as designated by Galet 1967 in the unpublished thesis). All analyses so far have supported the monophyly of each of the two sections based on leaf morphology (Galet 1967). Apart from the differences in leaf morphology, the two sections also differ in their axillary buds, with taxa in sect. *Ampelopsis* having serial accessory buds, and those in sect. *Leeaceifoliae* having complex axillary buds as in *Vitis vinifera* (Bernard 1972–1973; Gerrath and Posluszny 1989; Soejima and Wen 2006; Wen et al. 2007).

Within Vitaceae, five or six main clades are well supported based on analysis of molecular sequence data with the *Ampelopsis-Rhoicissus-Cissus striata* clade as one of these major clades of Vitaceae (Soejima and Wen 2006; Wen et al. 2007, 2013b; Ren et al. 2011; Liu et al. 2013). Ingrouille et al. (2002), however, resolved *Ampelopsis* as the basalmost branch of Vitaceae albeit with no support, and further argued that the presence of pinnate leaves, the thick corolla, and the floral and vegetative development in *Ampelopsis* were the least-derived characters within Vitaceae as compared with those in the outgroup taxa from Leeaceae. To maintain the monophyly of each of the genera of Vitaceae, we herein segregate the *Ampelopsis* sect. *Leeaceifoliae* lineage from *Ampelopsis*. Rafinesque (1838) established the genus *Nekemias* with *Ampelopsis bipinnata* Michx. [= *A. arborea* (L.) Koehne] possessing pinnately compound leaves as the type species. *Nekemias* has been rarely mentioned in subsequent taxonomic work on Vitaceae or treated as a synonym of *Ampelopsis* (Merrill 1949; Suessenguth 1953; Wen 2007), but it represents the earliest name at the generic rank for the pinnately-compound leaved *Ampelopsis* clade.

Taxonomic synopsis

***Nekemias* Raf., Sylva Tellur. 87. 1838.**

Ampelopsis Michx., pro parte

Woody climbers. Branchlets with prominent lenticels. Pith white, continuous through nodes. Tendrils leaf-opposed, mostly bifurcate to sometimes trifurcate, and lacking adhesive discs. Leaves alternate, petiolate, stipulate, pinnately to ternately bipinnately or sometimes tripinnately compound. Inflorescences bifurcately compound cymes, long peduncled, leaf-opposite. Flowers pedicellate, mostly bisexual; calyx saucer-like; corolla of 5 thick petals; stamens 5, opposite to petals; disc adnate to the base of the

ovary; ovary 2-locular, style short, conical, stigma rounded. Fruit a berry, globose or subglobose, purple, blue or black, 1-4 seeded. Seeds obovoid.

Type species. *Nekemias bipinnata* (Michx.) Raf. [= *Nekemias arborea* (L.) J. Wen & Boggan].

Nine species with eight occurring in warm temperate to tropical areas of eastern and southeastern Asia (Suessenguth 1940; Galet 1967; Chen et al. 2007), and one species distributed in eastern North America extending to the Caribbean (Brizicky 1965). This intercontinental disjunct distribution between eastern Asia and eastern North America represent a classical biogeographic pattern of the Northern Hemisphere (Wen 1999; Wen et al. 2010).

Below we provide a taxonomic synopsis for the genus.

1. *Nekemias arborea* (L.) J. Wen & Boggan, comb. nov.
urn:lsid:ipni.org:names:77142315-1
Figure 1A–B

Basionym: *Vitis arborea* L., Sp. Pl. 1: 203. 1753.
Ampelopsis bipinnata Michx., Fl. Bor.-Amer. 1: 160. 1803, nom. illeg.
Cissus stans Pers., Syn. Pl. 1: 143. 1805, nom. illeg.
Cissus bipinnata (Michx.) Nutt., Gen. N. Amer. Pl. 1: 144. 1818, nom. illeg.
Nekemias bipinnata (Michx.) Raf., Sylva Tellur. 87. 1838, nom. illeg.
Vitis bipinnata (Michx.) Torrey & A. Gray, Fl. N. Amer. 1: 243. 1838, nom. illeg.
Cissus arborea (L.) Des Moulins in Durand, Actes Soc. Linn. Bordeaux 24: 156. 1862.
Ampelopsis arborea (L.) Koehne, Deutsch. Dendrol. 400. 1893.
Ampelopsis arborea (L.) Rusby, Mem. Torrey Bot. Club 5: 221. 1894, comb. superfl.

Distribution. USA (Alabama, Arkansas, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Ohio, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia) and the Caribbean.

2. *Nekemias cantoniensis* (Hook. & Arn.) J. Wen & Z.L. Nie, comb. nov.
urn:lsid:ipni.org:names:77142316-1
Figure 1C–D

Basionym: *Cissus cantoniensis* Hook. & Arn., Bot. Beech. Voy.: 175. 1833.
Cissus diversifolia Walp., Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 19 (Suppl. 1): 314. 1843, nom. illeg., non DC. 1824.
Ampelopsis cantoniensis (Hook. & Arn.) K. Koch, Hort. Dendrol. 48: 11. 1853.
Vitis leeoides Maxim., Mel. Biol. Acad. Sci. St. Petersb. 9: 148. 1873.
Vitis cantoniensis (Hook. & Arn.) Seem., Bot. Voy. Herald: 370. 1875.
Ampelopsis cantoniensis (Hook. & Arn.) Planch., Monogr. Phan. 5: 460. 1887, comb. superfl.
Ampelopsis cantoniensis var. *harmandii* Planch., Monogr. Phan. 5: 460. 1887.

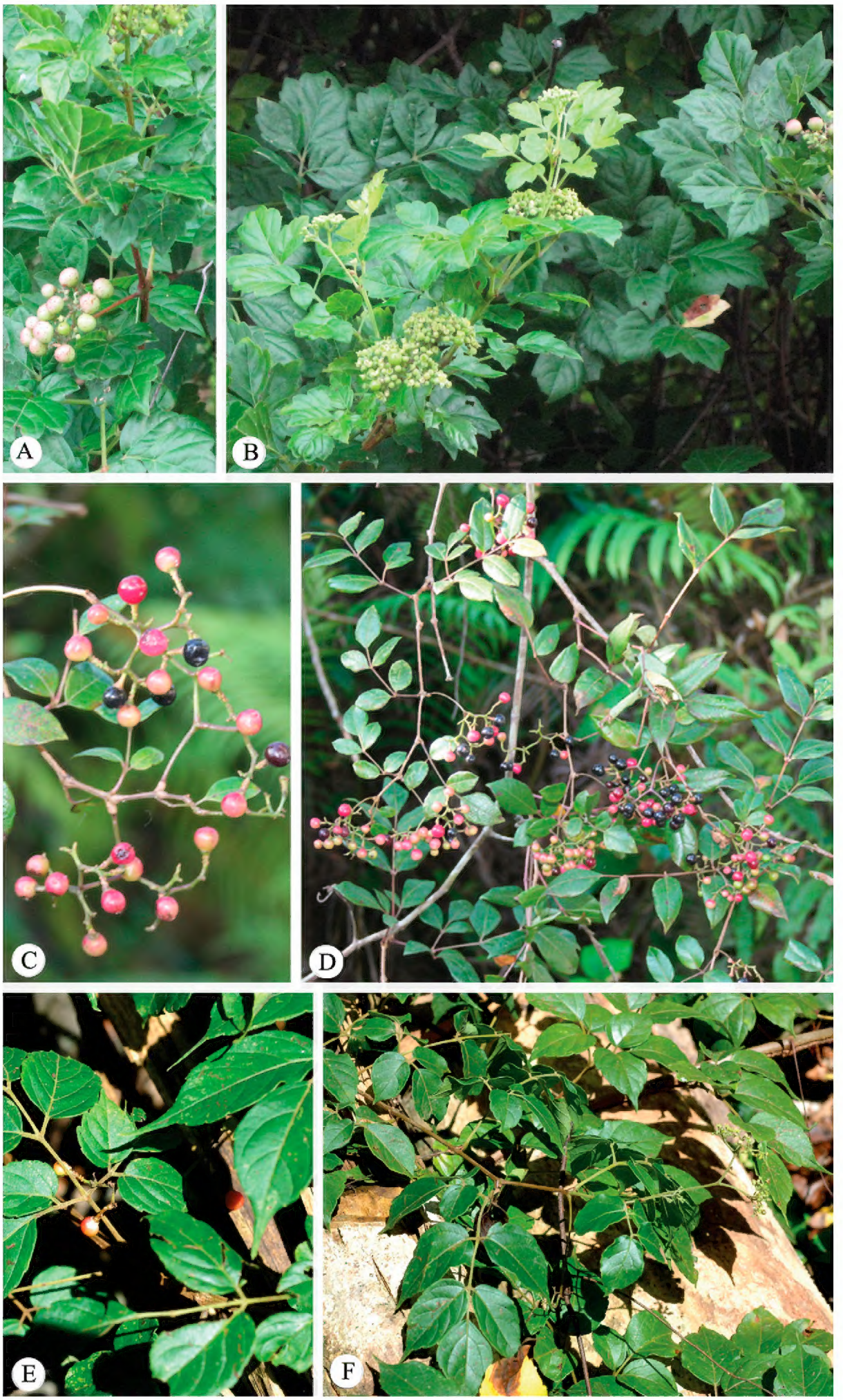

Figure 1. Images of representative species of *Nekemias* Raf. **A–B** *Nekemias arborea* (L.) J. Wen & Boggan, voucher specimen: *J. Wen 12005* (US), collected from Montgomery Co., Texas, USA **C–D** *N. cantoniensis* (Hook. & Arn.) J. Wen & Z.L. Nie, voucher specimen: *J. Wen 10613* (US), collected from Xichou Xian, Yunnan province, China **E–F** *N. celebica* (Suess.) J. Wen & Boggan, voucher specimen: *J. Wen 10242* (US), collected from SE Sulawesi, Indonesia.

Ampelopsis leeoides (Maxim.) Planch. [epithet published in error as "*lecoides*" by Planchon in 1887], Monogr. Phan. 5: 462. 1887.
Ampelopsis loureiroi Hort. Mazel. ex Planch., Monogr. Phan. 5: 461. 1887, nom. nud. pro syn.
Vitis multijugata H. Lév. & Vaniot, Bull. Soc. Agric. Sci. Arts Sarthe 40: 41. 1905.
Leea theifera H. Lév., Repert. Spec. Nov. Regni Veg. 8: 58. 1910.
Ampelopsis annamensis Gagnep., Bull. Soc. Bot. France 92: 166. 1946.
Ampelopsis cantoniensis var. *leeoides* (Maxim.) F.Y. Lu [published in error as "*leecoides*"; changed to "*lecoides*" in Index Kewensis], Fl. Taiwan 3: 667. 1977, nom. invalid.

Distribution. China (Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hong Kong, Hubei, Hunan, Taiwan, Xizang, Yunnan and Zhejiang), India, Japan (including the Ryukyu Islands), Vietnam, Laos, Malaysia (peninsular), and Indonesia (Java).

3. *Nekemias celebica* (Suess.) J. Wen & Boggan, comb. nov.
urn:lsid:ipni.org:names:77142317-1
Figure 1E–F

Basionym: *Ampelopsis celebica* Suess., Repert. Spec. Nov. Regni Veg. 49: 14. 1940.

Distribution. Indonesia (Sulawesi).

4. *Nekemias chaffanjonii* (H. Lév. & Van.) J. Wen & Z.L. Nie, comb. nov.
urn:lsid:ipni.org:names:77142323-1

Basionym: *Vitis chaffanjonii* H. Lév. & Van., Bull. Soc. Agric. Sci. Arts Sarthe 40: 37. 1905.
Leea dielsii H. Lév., Repert. Spec. Nov. Regni Veg. 8: 58. 1910.
Meliosma cavaleriei H. Lév., Repert. Spec. Nov. Regni Veg. 9: 457. 1911.
Ampelopsis watsoniana E.H. Wilson, J. Roy. Hort. Soc. 42: 37. 1916, nom. nud.
Vitis watsoniana (E.H. Wilson) Bean, Trees & Shrubs Brit. Isles 2: 673. 1921.
Ampelopsis chaffanjonii (H. Lév. & Van.) Rehder, J. Arnold Arbor. 15: 25. 1934.

Distribution. China (Anhui, Chongqing, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan and Yunnan).

5. *Nekemias gongshanensis* (C.L. Li) J. Wen & Z.L. Nie, comb. nov.
urn:lsid:ipni.org:names:77142318-1

Basionym: *Ampelopsis gongshanensis* C.L. Li, Chinese J. Appl. Environ. Biol. 2(1): 48. 1996.

Distribution. China (Yunnan).

6. *Nekemias grossedentata* (Hand.-Mazz.) J. Wen & Z.L. Nie, comb. nov.
urn:lsid:ipni.org:names:77142325-1

Basionym: *Ampelopsis cantoniensis* var. *grossedentata* Hand.-Mazz., Sitzungsber. Kaiserl. Akad. Wiss., Math.-Naturwiss. Cl., Abt. 1, 59: 105. 1877.
Ampelopsis grossedentata (Hand.-Mazz.) W.T. Wang, Acta Phytotax. Sin. 17(3): 79. 1979.

Distribution. China (Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi and Yunnan).

7. *Nekemias hypoglauca* (Hance) J. Wen & Z.L. Nie, comb. nov.
urn:lsid:ipni.org:names:77142319-1

Basionym: *Hedera hypoglauca* Hance, Ann. Bot. Syst. 2: 724. 1852.
Ampelopsis hypoglauca (Hance) C.L. Li, Chinese J. Appl. Environ. Biol. 2(1): 48. 1996.

Distribution. China (Fujian, Guangdong, Hong Kong and Jiangxi).

8. *Nekemias megalophylla* (Diels & Gilg) J. Wen & Z.L. Nie, comb. nov.
urn:lsid:ipni.org:names:77142320-1

Basionym: *Ampelopsis megalophylla* Diels & Gilg, Bot. Jahrb. Syst. 29: 466. 1900.

8a. *Nekemias megalophylla* (Diels & Gilg) J. Wen & Z.L. Nie var. *megalophylla*

Vitaeda megalophylla (Diels & Gilg) Börner, Abh. Nat. Ver. Bremen 21: 280. 1913.

Distribution. China (Chongqing, Gansu, Guizhou, Hubei, Shaanxi, Sichuan and Yunnan).

8b. *Nekemias megalophylla* var. *jiangxiensis* (W.T. Wang) J. Wen & Z.L. Nie, comb. nov.
urn:lsid:ipni.org:names:77142321-1

Basionym: *Ampelopsis jiangxiensis* W.T. Wang, Bull. Bot. Res. North-East. Forest. Inst. 1(1–2): 170. 1981.
Ampelopsis megalophylla var. *jiangxiensis* (W.T. Wang) C.L. Li, Chinese J. Appl. Environ. Biol. 2(1): 48. 1996.

Distribution. China (Jiangxi).

9. *Nekemias rubifolia* (Wall.) J. Wen & Z.L. Nie, comb. nov.
urn:lsid:ipni.org:names:77142322-1

Basionym: *Vitis rubifolia* Wall., Fl. Ind., ed. Carey & Wall., 2: 480. 1824.
Ampelopsis rubifolia (Wall.) Planch., Monogr. Phan. 5: 463. 1887.
Ampelopsis megalophylla var. *puberula* W.T. Wang, Acta Phytotax. Sin. 17(3): 79, 90. 1979.

Distribution. China (Guangxi, Guizhou, Hunan, Jiangxi and Sichuan), and India.

Taxonomic key to species of *Nekemias*

1 Leaves abaxially strongly glaucous **2**
1 Leaves green on both surfaces **3**
2 Lower leaves pinnately compound, leaflet blades 7–15 × 3–7 cm ..... ***N. chaffanjonii***
2 Lower leaves bipinnately compound, leaflet blades 2.5–6 × 1–3.5 cm ..... ***N. hypoglauca***
3 Leaves pinnately compound **4**
3 Leaves bipinnately, ternately bipinnately to tripinnately compound **5**
4 Leaflets 3.5–14 × 2–6.5 cm, margin 5–15-toothed, abaxially densely ferrugi-nous pilose; berries 8–15 mm in diameter ..... ***N. rubifolia***
4 Leaflets 3–6 × 0.5–3 cm, margin entire or with 1 to several inconspicuous teeth, midvein abaxially sparsely pilose; berries 5–7 mm in diameter ..... ***N. gongshanensis***
5 Tendril trifurcate; leaflets 4–12 × 2–6 cm ..... ***N. megalophylla***
5 Tendril bifurcate; leaflets 1–5 × 0.5–2.5 cm **6**
6 Leaflet margin with 2–4 large coarse teeth; from North America or the Carib-bean ..... ***N. arborea***
6 Leaflet margin serrate with 5–15 teeth on each side; from Asia 7
7 Leaflet margin coarsely serrate, central leaflet ovate-elliptical ..... ***N. grossedentata***
7 Leaflet margin ± undulate, central leaflet obovate or ovate **8**
8 Leaves and inflorescences pilose to glabrescent ..... ***N. cantoniensis***
8 Leaves and inflorescences pubescent to densely so ..... ***N. celebica***

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